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Fish surveys in the Honhosa River,
North Fork Huslia River, and Billy Hawk Creek,
Koyukuk National Wildlife Refuge, Alaska, 1993

David W. Wiswar



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DAVID W. WISWAR

Fishery Resources Office
U.S. Fish and Wildlife Service
101 12th Avenue, Box 17
Fairbanks, Alaska 99701
(907) 456-0219

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*Fishery Resources Office
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Abstract.—Fish surveys were conducted in the Honhosa River and North Fork Huslia rivers, and Billy Hawk Creek during July and August 1993. Several gear types were used to capture fish; they were electrofisher, hook and line, variable mesh gill net, and minnow traps. Fish species captured were northern pike, longnose sucker, three species of whitefish, Arctic grayling, chum salmon, burbot, and slimy sculpin. In general, resident fish species such Arctic grayling, slimy sculpin, and round whitefish were found in the Honhosa River which runs relatively clear over a gravel and cobble substrate. Whereas, broad and humpback whitefish, northern pike, and longnose sucker were found in the slower moving, tannic stained North Fork Huslia River and Billy Hawk Creek which have a substrate composition of sand and silt.

The Koyukuk National Wildlife Refuge (Koyukuk Refuge) was established under Section 302(5) of the Alaska National Interest Lands Conservation Act of 1980 (U.S. Public Law 96-487; ANILCA). One of the purposes for the establishment of the refuge was to conserve fish and wildlife populations and their habitats in their natural diversity.

The distribution and range of twenty species of fish extends to the rivers and lakes of the Koyukuk drainage (Table 1); however, more species may be present since few fishery inventories have been conducted.

Surveys in selected tributaries of the Koyukuk River drainage have been conducted to obtain estimates of salmon escapement. Chinook salmon runs have been observed by aerial survey in the Kateel, Gisasa, Dakli, and Indian rivers (Barton 1984). Summer chum salmon were observed in the Kateel, Gisasa, Dakli, Indian, and North Fork Huslia rivers (Barton 1984), and Billy Hawk Creek (Hawkinson and Deshermeier 1985). In other fishery investigations, sheefish were captured in the mainstem Koyukuk River near Hughes (Alt 1975). Northern pike, broad whitefish, humpback whitefish, least cisco, longnose sucker, ninespine stickleback, and Alaska blackfish were captured in lakes in the Koyukuk drainage in 1984 and 1985 (Glesne 1986).

Fishery investigations were conducted in three streams, the Honhosa and North Fork Huslia rivers, and Billy Hawk Creek, on the Koyukuk Refuge during the summer of 1993. The objectives were:

1. Determine spatial distribution of fish by life stage (young of the year, juvenile, and adult) in rivers.
2. Determine baseline length and weight information from fish in rivers.

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Methods

The mainstems of the North Fork Huslia and Honhosa rivers, and Billy Hawk Creek were sampled during late July and August of 1993 for fish distribution (Figures 1-3). Sample sites in each river were established approximately every 10-15 km and near the mouth of major tributaries. Sample sites were located from USGS 1:250,000 and 1:63,360 topographic maps. Hydrologic characteristics of stream width and water depth were measured and bankfull width, bank slope, and substrate composition were estimated at each sampling site. Substrate composition was classified by particle size described by Platts et al. (1983).

Fish were collected with baited minnow traps, hook and line, dip nets, backpack electrofisher (Smith-Root Model 15A, 600 - 1100 volts, 60 - 90 pulses/s), and gill nets (Appendix). Minnow traps (40.6 x 20.3 cm, 0.6 cm bar mesh) were baited with processed salmon egg clusters or fish flesh. The number of traps per site ranged from 8 to 10. Traps were spaced at least 12 m apart and checked after a 24 h set. Dip nets were constructed of 0.16 cm ace mesh. Monofilament variable mesh gill nets consisted of four panels (3 m wide x 1.8 m deep) of 1.3, 2.5, 3.8, and 5.1 cm bar mesh.

All fish captured were identified and counted. Fish length measurements were dependent on body morphology. Fork lengths (FL) were measured in most cases, however, mid-eye to fork length (MEL) was used for adult salmon, and total length (TL) for burbot and sculpins. Fish over 200 mm FL were weighed to the nearest 10 grams and those fish less than 200 mm FL to the nearest 0.1 g. Small fish (< 35 mm) were not weighed. Small fish (< 200 mm FL) were placed in a solution of tricaine (MS 222) before measuring.

Arctic grayling were separated by life history stage (young of the year, juvenile, and adult) on the basis of fork length. Arctic grayling less than 75 mm FL were considered to be young of the year. Fish less than 270 mm FL were considered juveniles and those equal to or greater than 270 mm FL were adults (Fleming and Reynolds 1991).

Results

Honhosa River

Riverine characteristics.— The mainstem Honhosa River was surveyed at 10 sites along 85 km of its length (about 80 % of the mainstem river) on August 7 - 13 (Figure 1). The sites were accessed by helicopter as water level was too low for travel by raft or boat. The substrate composition was sand, silt, and medium size gravel in the lower 22 km (sites 1-3) and gravel, sand, and cobble in the upper reaches (sites 4-10). At the time of survey water width was between 6 - 12 m, pool depths were less than 1.2 m, and riffle depths were less than 0.2 m. Water was clear and uncolored.

Fish distribution.— All ten sites were sampled by backpack electrofisher. In addition, three sites were sampled by angling (sites 7, 9, and 10), and a dip net was used at a site near the river mouth (site 1; Figure 1). Adult, juvenile, and young of the year Arctic grayling, young of the year longnose sucker, slimy sculpin, burbot, and round white fish were captured. Adult and juvenile Arctic grayling were captured at three upper sites (sites 7, 9, and 10) and juveniles were captured at site 3. Young of the year Arctic grayling were captured at the sites 3, 7, and 8. Young of the year longnose sucker were captured at the four lower sites (sites 1-4). Slimy sculpin were the most ubiquitous fish in the river; they were captured at eight sites. Burbot were captured at the site near the mouth and an upper site (sites 1 and 7) and round white fish were captured at site 7.

Biological characteristics.— Young of the year Arctic grayling ranged from 56 to 76 mm FL, juveniles captured by both the electrofisher and hook and line were 107 - 269 mm FL, and adults captured by angling were 293 - 405 mm FL (Table 2). Young of the year longnose sucker measured 29 - 47 mm FL. Slimy sculpin were 33 - 92 mm TL.

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North Fork Huslia River

Riverine characteristics.— The lower 25 km of the North Fork Huslia River beginning at the confluence of the South Fork (65° 52.6'N, 157° 35.8'W) was travelled using an inflatable raft between July 23 and 28. The river meanders with a relatively high degree of sinuosity in this reach. At the time of survey the river may be described as a slow moving glide or run. Water was discolored by organic acids. Substrate material was sand and silt. Water width was about 10 m and water depth was less than 1.5 m. Bankfull conditions were estimated at 30 m wide and 11 m deep. Side slopes were high (approximately 10 m) and steep (estimated at 45°).

Fish distribution.— Four sites were sampled within the lower 25 km of the North Fork Huslia River and one site in the mainstem Huslia River about 1 km below the North Fork and South Fork confluence (Figure 2). Northern pike, broad whitefish, and longnose sucker were captured at the mainstem site. In the North Fork, northern pike were captured at 3 of the 4 sites and humpback whitefish were captured at one site. Unidentified young of the year fish were observed at one site in the North Fork Huslia River.

Biological characteristics.— Northern pike captured by both gill nets and hook and line ranged from 433 to 717 mm FL. Broad whitefish captured by gill nets were 457 - 554 mm FL, longnose sucker were 432 - 520 mm FL, and one humpback whitefish was 438 mm FL (Table 2). Presumably, all fish were adults as their lengths corresponded to minimum age at maturity (Scott and Crossman 1973; Morrow 1980).

Billy Hawk Creek

Riverine characteristics.— The lower 45 km of the Billy Hawk Creek, beginning at the confluence of the Huslia River (65° 56.7'N, 156° 40.7'W), was travelled using an inflatable raft between August 18 and 25. Six sites on the Billy Hawk Creek and one site on the mainstem Huslia River were sampled (Figure 3). On USGS maps prior to 1963, Billy Hawk Creek is designated as the North Fork Huslia River. Billy Hawk Creek meanders with a relatively high degree of sinuosity in this reach. At the time of survey the river may be described as a glide or run. Mainstem channel water width was 30 m and depth was greater than 3 m. Substrate material was comprised predominately of sand and silt. Water was stained by organic acids.

Fish distribution.— Chum salmon, northern pike, broad whitefish, burbot, longnose sucker, and slimy sculpin were captured. Northern pike were captured at four sites in Billy Hawk Creek (sites 2, 3, 5, and 6; Figure 3). Chum salmon were captured at sites 2 and 4 and slimy sculpins were captured at sites 3, 4, and 5. Broad whitefish were captured only at site 6. In the mainstem Huslia River, adult size and young of the year northern pike, burbot, and young of the year longnose sucker were captured.

Biological characteristics.— Adult size northern pike captured in Billy Hawk Creek by gill net and hook and line measured 450 - 868 mm FL (Table 2). The smaller size northern pike (108 - 117 mm FL), given the late date of capture, were in the length range for young of the year fish (Morrow 1980). Chum salmon ranged from 510 to 556 mm MEL ($N = 3$, $\bar{x} = 540.3$, $SD = 26.3$), broad whitefish were 356 - 515 mm FL ($N = 2$, $\bar{x} = 523.7$, $SD = 112.5$), and slimy sculpin were 37 - 76 mm TL ($N = 5$, $\bar{x} = 54.6$, $SD = 14.3$).

Discussion and Recommendations

Fish species captured in the North Fork Huslia and Honhosa rivers, and Billy Hawk Creek were similar to reported captures in other tributaries of the middle Yukon River drainage. In Nowitna River surveys conducted between 1967 and 1994, fish species captured included three species of salmon, four species of whitefish, and northern pike (Table 1). Two other drainages of the Yukon River above the confluence of the Koyukuk River were previously sampled. The Melozitna River was surveyed in July 1980 and June 1983, and the Tozitna River in September 1983 (Alt 1984; Table 1). Twelve fish species were common to both drainages and included three species of salmon, four species of whitefish, Arctic grayling, burbot,

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northern pike, and Dolly Varden char. Additionally, in the Tozitna River least cisco and slimy sculpin were captured.

In the Innoko River and selected tributaries, nineteen species of fish were captured during surveys conducted in 1981, 1982, and 1993 (Alt 1983; U.S. Fish and Wildlife Service, unpublished data) and include all species listed in Table 1 with the exception of trout-perch, Bering cisco, and lake chub.

In general, resident fish species such as Arctic grayling, slimy sculpin, and round whitefish are found in rivers and streams that run relatively clear over a gravel and cobble substrate. Whereas, broad and humpback whitefish, northern pike, and longnose sucker are found in slower moving, organic acid stained rivers with a substrate composition of sand and silt.

While surveys in the North Fork Huslia and Honhosa rivers and Billy Hawk Creek gave a cursory description of fish species presence/absence and distribution, they were limited in their temporal and spatial assessment. This was due to the short duration of the studies and the small number of sites sampled relative to the length of the drainage. The small extent of the spatial element should be particularly noted for the North Fork Huslia River and Billy Hawk Creek. More specific studies will be necessary to examine life history traits including migration timing, spawning and overwintering areas, and population structure and size.

Knowledge of the seasonal distribution and biology of the fish species using a river drainage is an important management consideration. A comprehensive and systematic approach to studying the river drainages on the refuge should be considered to obtain sufficient baseline information.

Access to upper river sites was a major obstacle in determining fish distribution throughout the drainage in 1993. Low river water depths precluded travel by boat or inflatable raft to these areas. There is a lack of suitable and safe landing areas for float plane or helicopter. Larger lakes for landing and take off of a float plane in the upper part of the drainages are lacking and trees and high shrubs limit landing with a helicopter. Some logistic problems may be worked out in late winter and early spring when travel by snow machine would make it possible to stage gear and equipment for later use.

Acknowledgements

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TABLE 1.— Fish species whose range includes the Koyukuk National Wildlife Refuge and other Interior Alaska rivers of the Yukon drainage.

Common name	Scientific name	Presence by drainage				
		Koyukuk ^a	Nowitna ^b	Melozitna ^c	Tozitna ^c	Innoko ^d
Arctic lamprey	<i>Lampetra japonica</i>		x			x
Sheefish	<i>Stenodus leucichthys</i>	x	x			x
Bering cisco	<i>Coregonus laurettae</i>		x		x	
Broad whitefish	<i>C. nasus</i>	x ^e	x			x
Humpback whitefish	<i>C. nelsoni</i>	x ^e	x			x
Least cisco	<i>C. sardinella</i>	x	x		x	x
Round whitefish	<i>Prosopium cylindraceum</i>	x ^e	x		x	x
Chum salmon	<i>Oncorhynchus keta</i>	x ^e	x		x	x
Coho salmon	<i>O. kisutch</i>		x		x	x
Chinook salmon	<i>O. tshawytscha</i>		x		x	x
Sockeye salmon	<i>O. nerka</i>	x	x		x	x
Dolly Varden	<i>Salvelinus malma</i>				x	x
Arctic grayling	<i>Thymallus arcticus</i>	x ^e	x			x
Pond smelt	<i>Hypomesus olidus</i>				x	x
Alaska blackfish	<i>Dallia pectoralis</i>	x	x			x
Northern pike	<i>Esox lucius</i>	x ^e	x			x
Lake chub	<i>Couesius plumbeus</i>			x		
Longnose sucker	<i>Catostomus commersoni</i>	x ^e		x		x
Trout-perch	<i>Percopsis omiscomaycus</i>			x		
Burbot	<i>Lota lota</i>	x ^e	x			
Slimy sculpin	<i>Cottus cognatus</i>	x ^e				x
Ninespine stickleback	<i>Pungitius pungitius</i>	x			x	x

^a = Alt (1975); Barton (1984); Hawkinson and Deshermeier (1985); (Glesne 1986); and this study.

^b = Alt (1985); U.S. Fish and Wildlife Service, unpublished data.

^c = Alt (1984).

^d = Alt (1883); Glesne (1986); U.S. Fish and Wildlife Service, unpublished data.

^e = Fish species captured during this study in either the Honhosa River, North Fork Huslia River, or Billy Hawk Creek.

TABLE 2.—Lengths and weights of fish captured in the Honhosa and North Fork Huslia rivers and Billy Hawk Creek during July and August 1993. GR = Arctic grayling, BB = burbot, LNS = longnose sucker, RWF = round whitefish, SS = slimy sculpin, NoP = northern pike, BWF = broad whitefish, HWF = humpback whitefish, Chum = chum salmon, yoy = young of the year, juv = juvenile, ad = adult, VMGN = variable mesh gill net.

Date	Gear	Species	Length (mm)				Weight (g)			
			N	Mean	SD	Range	N	Mean	SD	Range
Honhosa River										
Aug 7-13	Electrofisher	GR yoy	28	63.1	4.9	56-76	27	2.1	0.4	1.5-3.2
	Electrofisher	GR juv	6	126.2	23.6	107-173	5	21.2	16.1	12.2-50.0
	Electrofisher	BB	3	128.3	122.0	52-269	3	32.4	54.2	0.9-95.0
	Electrofisher	LNS	73	36.3	3.6	29-47				
	Electrofisher	RWF	1	216			1	100.0		
	Electrofisher	SS	173	53.2	12.0	33-92	172	1.6	1.2	0.3-7.8
	Hook and line	GR juv	3	224.7	44.0	181-269	3	110.0	65.6	50-180
	Hook and line	GR ad	8	328.9	36.3	293-405	8	332.5	97.7	150-480
	Dip net	LNS	1	43			1	1.0		
North Fork Huslia River ^a										
Jul 23-28	VMGN	NoP	7	559.6	76.8	451-669	5	1130.0	495.8	550-1900
	VMGN	BWF	4	502.8	41.1	457-554	3	1533.3	236.3	1350-1800
	VMGN	LNS	7	478.0	26.7	432-520	7	1369.0	269.9	940-1770
	VMGN	HWF	1	438			1	1250		
	Hook and line	NoP	4	594.5	126.1	433-717	2	887.5	512.7	525-1250

TABLE 2.— continued.

Date	Gear	Species	Length (mm)				Weight (g)			
			N	Mean	SD	Range	N	Mean	SD	Range
Aug 18-25			Billy Hawk Creek ^a							
	VMGN	Chum	3	540.3	26.3	510-556	3	2566.7	750.6	1700-3000
	VMGN	NoP	10	523.7	54.3	450-637	10	1087.0	356.1	700-1925
	VMGN	BWF	2	435.5	112.4	356-515	2	1415.0	1251.6	530-2300
	Hook and line	NoP	6	665.7	165.6	490-868	6	2391.7	1532.9	950-4700
	Minnow traps	NoP	2	112.5	6.4	108-117	2	9.1	1.7	7.9-10.3
	Minnow traps	SS	5	54.6	14.3	37-76	2	2.9	2.0	1.5-4.3
	Minnow traps	BB	1	100			1	4.7		
	Minnow traps	LNS	2	53.0	5.7	49-57	2	1.4	0.4	1.1-1.6

^a = includes adjacent Huslia River mainstem site within 1 km of the confluence.

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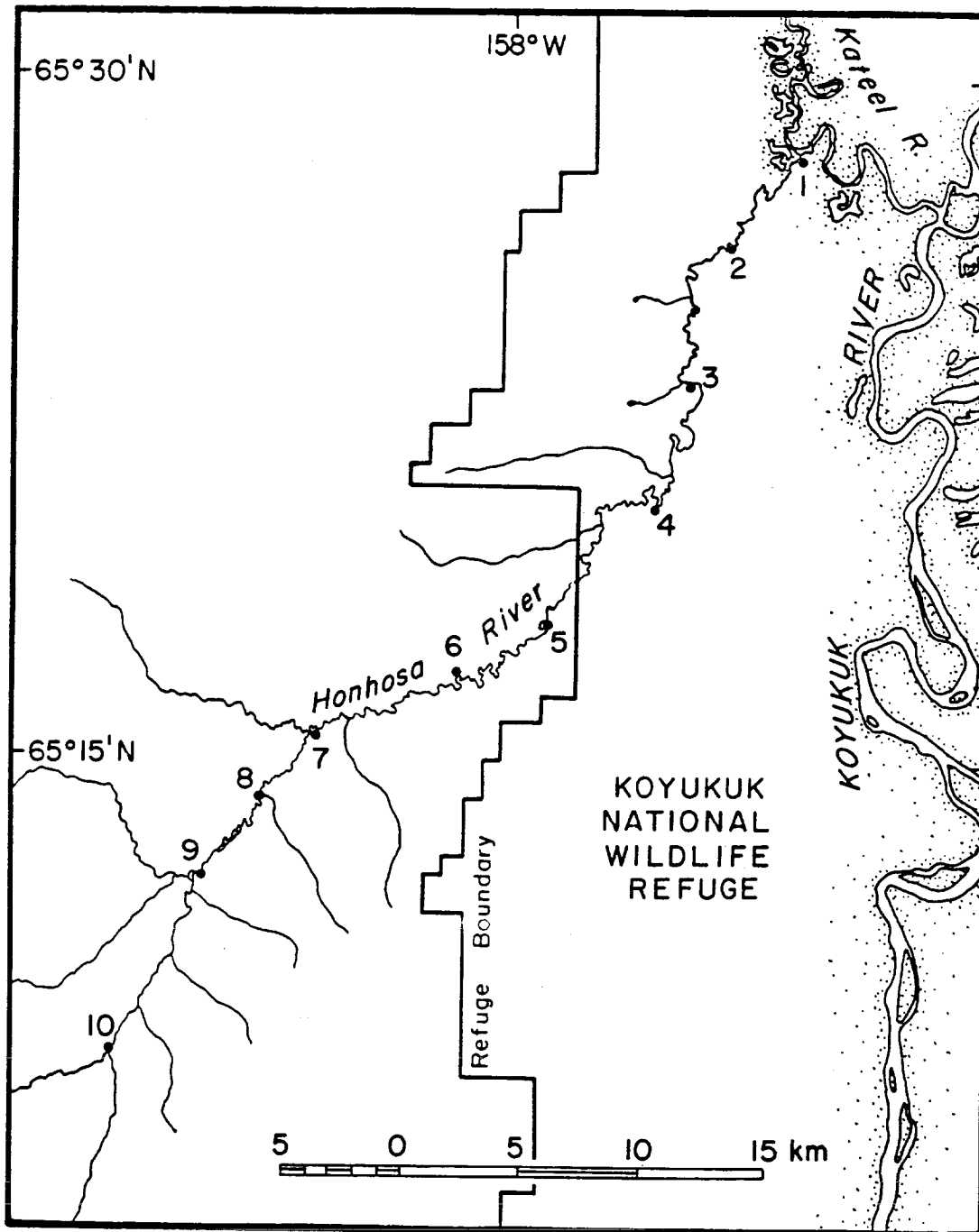


FIGURE 1.— Sample sites in the Honhosa River, August 1994.

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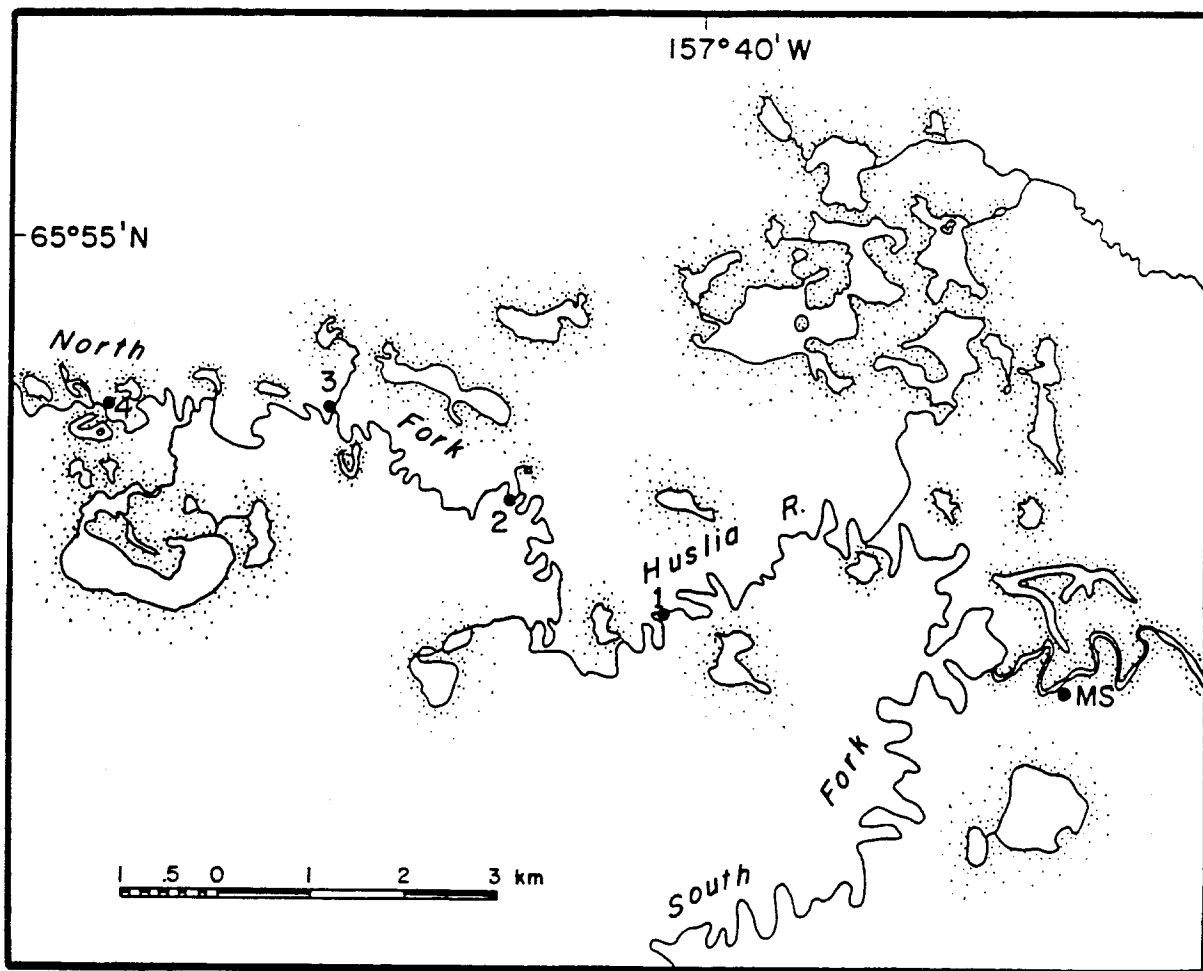


FIGURE 2.— Sample sites in the North Fork and mainstem Huslia River, July 1994. MS = mainstem site.

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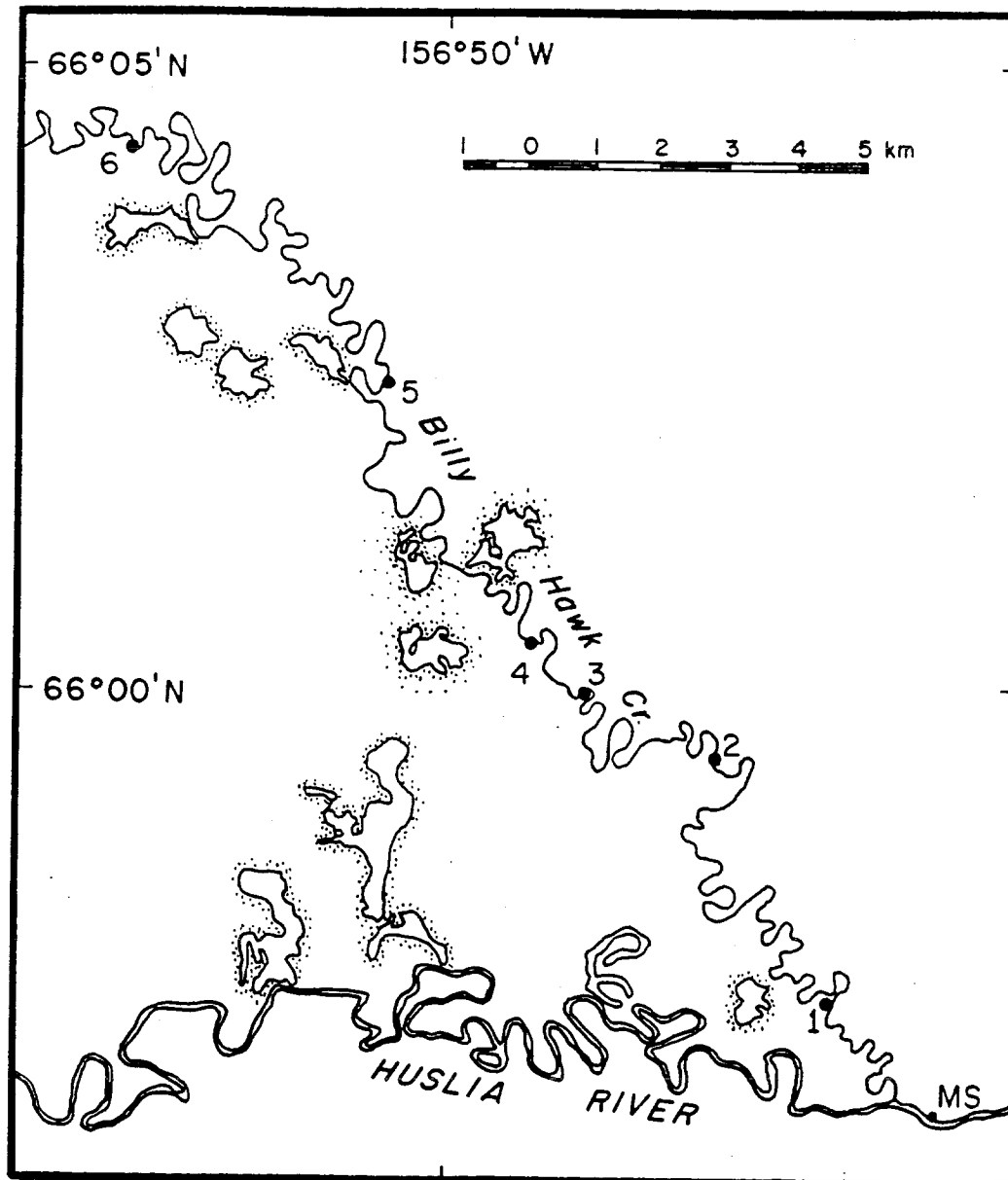


FIGURE 3.— Sample sites in Billy Hawk Creek and mainstem Huslia River, August 1994. MS = mainstem site.

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APPENDIX.— Summary of gear used and fish capture information for the Honhosa and North Fork Huslia rivers and Billy Hawk Creek, July and August 1993. GR = Arctic grayling, BB = burbot, LNS = longnose sucker, SS = slimy sculpin, RWF = round whitefish, NoP = northern pike, BWF = broad whitefish, HWF = humpback whitefish, Chum = chum salmon, yoy = young of the year, juv = juvenile, ad = adult, VMGN = variable mesh gill net.

Sampling period	No. of stations	Gear type	Number of sets/site	Effort (h)	Species	N
Honhosa River						
Aug 7-13	10	Electrofisher		3.8	GR yoy, juv, ad	34
		Electrofisher			BB	3
		Electrofisher			LNS	73
		Electrofisher			SS	173
		Electrofisher			RWF	1
	3	Hook and line		2.3	GR	11
	1	Dip net			LNS	1
North Fork Huslia River ^a						
Jul 23-28	5	VMGN	1-2	34.3	NoP	8
		VMGN			LNS	7
		VMGN			BWF	5
		VMGN			HWF	1
	4	Hook and line		7.9	NoP	4
	5	Minnow traps	10		120.5	
	Billy Hawk Creek ^a					
Aug 18-25	7	VMGN	2	45.8	NoP	11
		VMGN			Chum	4
		VMGN			BWF	2
	3	Hook and line		5.4	NoP	10
	6	Minnow traps	10		143.1	NoP
		Minnow traps		LNS		2
		Minnow traps		BB		1
		Minnow traps		SC		5

^a = includes adjacent Huslia River mainstem site within 1 km of the confluence.